

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
31 January 2002 (31.01.2002)

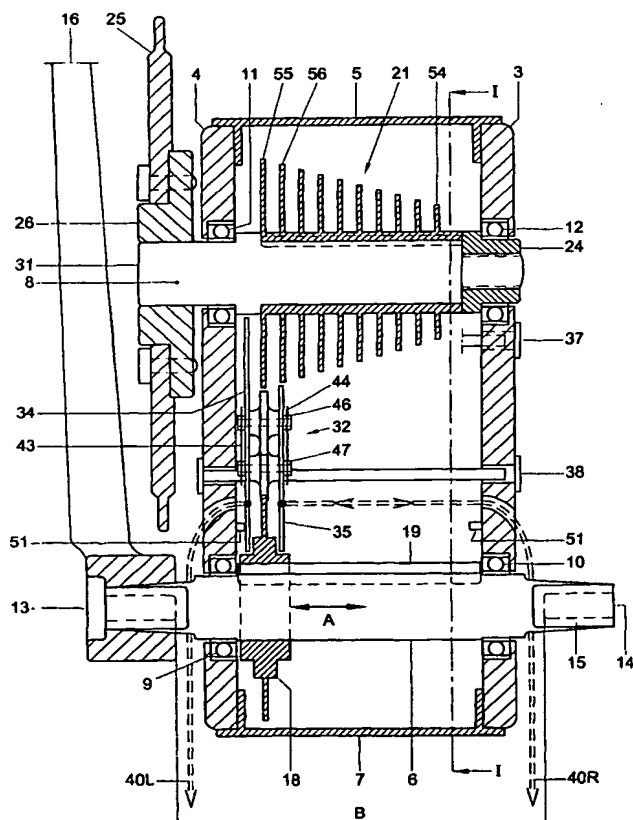
PCT

(10) International Publication Number
WO 02/08050 A1

- (51) International Patent Classification⁷: **B62M 9/04**, 11/06
- (74) Agent: PRINS, A., W.; Vereenigde, Nieuwe Parklaan 97, NL-2587 BN The Hague (NL).
- (21) International Application Number: PCT/NL01/00551
- (22) International Filing Date: 19 July 2001 (19.07.2001)
- (25) Filing Language: Dutch
- (26) Publication Language: English
- (30) Priority Data:
1015777 21 July 2000 (21.07.2000) NL
- (71) Applicant and
(72) Inventor: VAN DER LINDE, Petrus, Maria [NL/NL];
Bergvennenweg 35, NL-7635 NJ Lattrop (NL).
- (81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.
- (84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

[Continued on next page]

(54) Title: GEAR FOR A BICYCLE



(57) Abstract: The invention relates to a compact installation gear with, for instance, a 3/8" derailleur chain and a derailleur for setting a transmission ratio between a crankshaft and a rear hub of a bicycle. To that end, the gear comprises a compact housing with the crankshaft included therein, with a slidable driving first sprocket engaging, via the derailleur chain, a selected second sprocket which forms part of a series of second sprockets mutually different in diameter, located on a secondary shaft with a third sprocket mounted thereon outside the housing, which, in turn, via a roller chain, drives a fourth sprocket on the rear hub. The transmission ratio can be set with the aid of the derailleur by moving the derailleur chain over the different second sprockets while at the same time moving the driving first sprocket to a position directly opposite the selected second sprocket.

WO 02/08050 A1



Published:

— with international search report

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

Title: Gear for a bicycle

The invention relates to a gear for setting a transmission ratio between a crankshaft and a rear hub of a bicycle.

From practice, a gear is known wherein a sprocket cassette, located on a rear hub and containing a number of sprockets of different diameter, is driven via a bicycle chain by a sprocket fixedly mounted on a crankshaft. To obtain a desired transmission ratio between the crankshaft and the rear hub, the bicycle chain is moved between the different sprockets on the rear hub with the aid of a derailleur, located near the rear hub. To that end, the derailleur comprises a chain tensioner with two guiding wheels, over which and between which the bicycle chain is guided. By means of two parallel arms, these guiding wheels can be positioned directly opposite each of the respective sprockets, thus moving the part of the bicycle chain between the guiding wheels and the sprockets in a parallel manner.

A drawback of the known gear is that the sprocket cassette and the derailleur take up a lot of space on and near the rear hub. As a result, the rear wheel has to be spoked in an asymmetrical manner, at the expense of the stability and strength of this rear wheel. Furthermore, it is difficult to screen the arrangement from moisture and dirt.

The invention aims to provide a gear wherein the drawbacks of the known gear are avoided, while its advantages are maintained. To that end, a gear according to the invention is characterized by the features of claim 1.

By moving the series of sprockets and the derailleur from the rear hub to a secondary shaft near the crankshaft, a very compact gear is obtained. Due to the limited dimensions, this gear can be readily provided with a protective housing. Furthermore, on the rear hub, a single fourth sprocket can suffice. Thus, space is created to spoke the rear wheel in a symmetrical manner, so that an even loading of the spokes and the wheel rim is obtained, which is of benefit to the strength and stability of the rear wheel.

In an advantageous embodiment, a gear according to the invention is characterized by the features of claim 2.

As the driving first sprocket can move in axial direction on the crankshaft, a very compact derailleur can be built, while optimal use is made of the space between cranks mounted on both sides on the crankshaft. With this derailleur, a gear can be realised which fits between the cranks and which hardly projects on either side of the frame.

In a further embodiment, a gear according to the invention is characterized by the features of claim 3.

With a derailleur according to the invention, the driving first sprocket can in each case be positioned directly opposite the second sprocket to be driven. The first roller chain therefore lies in line between these sprockets, so that this roller chain is only loaded in longitudinal direction, which is favorable to its life span. Moreover, as no kinks or curves have to be compensated in the roller chain, a very short chain suffices, so that the distance between the crankshaft and the secondary shaft can be reduced. In this manner, an even more compact gear is obtained.

In a further advantageous embodiment, a gear according to the invention is characterized by the features of claims 5 and 6.

The freedom of choice in diameter of the driving first and third sprockets and the driven second and fourth sprockets, offers the possibility to optimize aspects of the gear while maintaining a desired transmission ratio between the crankshaft and the rear hub. An aspect to be optimised can be, for instance, the dimensions of the gear. For a more compact gear, the diameter of the driving third sprocket on the secondary shaft can be selected to be relatively small, so that the distance between the secondary shaft and the crankshaft can be reduced. To compensate this smaller driving third sprocket, the diameter of the driving first sprocket can be increased and/or the diameters of the fourth sprocket on the rear hub and/or the second sprockets

on the secondary shaft can be reduced in order to still maintain a sufficiently large transmission ratio between the crankshaft and the rear hub.

In a comparable manner, other aspects can be optimised such as the operation of the derailleur, which can be improved by selecting the difference
5 in diameter between successive second sprockets to be small, or the forces on the secondary shaft, which can be reduced by reducing the second and third sprockets mounted thereon.

In a further embodiment, a gear according to the invention is characterized by the features of claim 7.

10 The transmission range of the gear and the step size between the successive transmission ratios is determined by the amount of gearing of the second sprockets as well as by the difference in the number of teeth between the successive second sprockets. Thus, either a large transmission range with relatively large steps between the successive transmission ratios or a smaller
15 transmission range with a finer adjustment possibility can be realised. Hence, with the choice of the second sprockets, the gear can be adjusted to the demands of various types of bicycles and riding situations.

In an advantageous embodiment, a gear according to the invention is characterized by the features of claim 10.

20 With a narrow roller chain, the second sprockets on the secondary shaft can be positioned closer together so that a still narrower gear can be obtained. However, it is also possible to install more second sprockets while the width of the gear remains the same, so that the number of speed options of the gear increases.

25 In an especially advantageous embodiment, a gear according to the invention is characterized by the features of claim 12.

Due to the compact construction, the gear can simply be enclosed in a housing. This protects the gear from external influences, such as moisture and dirt. It leads to less wear of the parts, less maintenance and a longer life
30 span. Additionally, the housing offers the cyclist protection, for instance with

respect to splashing dirt and the risk of clothing getting caught between the moving parts. Further, the housing contributes constructively to the support of the driving parts, i.e. the crankshaft and the secondary shaft. These shafts can be bearing mounted in the housing in a simple manner. Finally, the housing
5 facilitates the installation and attachment of the gear to the bicycle, the more so when the housing is fixedly mounted in the frame of the bicycle with a mounting bracket.

The invention also relates to a bicycle provided with a gear according to the invention, characterized by the features of claim 19.

10 Due to the limited dimensions of the gear and the rigidity of the housing, the gear can be mounted in the bicycle frame in several positions, with the position of the crankshaft being substantially fixed while the position of the secondary shaft in relation to the crankshaft can be varied. As a result, the gear is suitable for installation in frames of various shapes and sizes.

15 In the additional subclaims, further advantageous embodiments of a gear according to the invention and a bicycle provided with such a gear are described.

In clarification of the invention, an exemplary embodiment of a gear according to the invention as well as its operation and a method for
20 installation of such a gear in a bicycle will be further elucidated on the basis of the drawing.

In the drawing:

Fig. 1 shows, in side view, a cross section of a gear according to the invention at the line I-I in Fig. 2;

25 Fig. 2 shows, in top plan view, a cross section of the gear of Fig. 1 at the line II-II in Fig. 1;

Fig. 3 shows, in side view, two positions of a chain tensioner of a derailleur according to Figs. 1 and 2;

30 Fig. 4 shows a step of the installation process of a gear according to the invention; and

Fig. 5 shows two bicycles with possible installation positions of a gear according to the invention.

Figs. 1 and 2 show, in cross section, a side and top plan view, respectively, of a gear 1 which can be installed near a crankshaft 6 of a bicycle 30 between frame parts of that bicycle. With the gear 1, the transmission ratio between the crankshaft 6 driven by a cyclist and a rear hub 29, and hence the acceleration, can be adjusted to, inter alia, the riding conditions and the personal preference of the cyclist. What is meant hereinbelow by transmission ratio is the relation between the number of revolutions of a driving shaft and the number of revolutions of a driven shaft. What is meant by acceleration is the product of the transmission ratio between crankshaft and rear hub and the wheel diameter of the bicycle.

The gear 1 is included in a housing 2, comprising a first side plate 3 and a second side plate 4, which are mutually connected along their circumference by a mounting bracket 5. With this mounting bracket 5, the gear 1 can be mounted onto the bicycle, in a manner to be described hereinafter. Between the first side plate 3 and the second side plate 4, a crankshaft 6 is bearing-mounted by means of a first and a second ball bearing 9, 10. Parallel to the crankshaft 6, and at a relative short distance therefrom, a secondary shaft 8 is bearing-mounted in a third and a fourth ball bearing 11, 12, respectively. The secondary shaft 8 is driven by the crankshaft 6 by means of a first sprocket 18 on the crankshaft 6 which, via a first roller chain 20, is connected to a second sprocket 22 which forms part of a sprocket cassette 21 on the secondary shaft 8. The secondary shaft 8, in turn, drives a rear hub 29 by means of a third sprocket 25 which, via a second roller chain 27, engages a fourth sprocket on the rear hub 29.

To drive the crankshaft 6, two ends 13, 14 of this crankshaft 6, reaching outside the housing 2, are connected in a manner known per se via cranks 16 to pedals (not shown). The connection between the cranks 16 and the crankshaft ends 13, 14 is such that it can transmit the substantial forces

applied by a cyclist to the pedals to the crankshaft 6. This can be done in a manner known per se, for instance by means of a key connection, or, as shown in Figs. 1 and 2, by means of a keyless, form-closed connection, whereby the forces mentioned are transmitted via four levelled sides 15 of the tapered
5 crankshaft ends 13, 14.

The driving first sprocket 18 is mounted on the crankshaft 6 with the aid of a key 19. To that end, the crankshaft 6 is provided with a keyway, while the first sprocket 18 is provided with a shaft hole such that it can move, guided by the key, in the axial direction of the crankshaft 6, as indicated by
10 the arrow A in Fig. 2, but cannot rotate relative to this crankshaft 6. It will be directly clear that such a connection can also be brought about in another manner known from practice, for instance by means of a cam in the shaft hole of the first sprocket 18, which engages in an axially extending slot in the surface of the crankshaft 6, or by means of a key toothing, extending over the
15 length of the crankshaft 6, and a cooperating shape of the shaft hole in the first sprocket 18.

The driving third sprocket 25 is fixedly mounted on an end 31 of the secondary shaft 8, for instance by means of a pulley 26, which end 31 extends through the second side plate 4 to outside the housing 2. Further, on this
20 secondary shaft 8, a sprocket cassette 21 is mounted so as to be secured against rotation, by means of, for instance, a second key 23 and a clamping nut 24, as shown in Fig. 2. The sprocket cassette 21 comprises a series of second sprockets 22, with different diameters and different numbers of teeth. The second sprockets 22 are arranged from large to small, the largest second
25 sprocket 55 being preferably located near the driving third sprocket 25 to decrease the torsional forces on the secondary shaft 8.

The first roller chain 20, between the driving first sprocket 18 and a respective one of the second sprockets 22, has links of a length of, preferably, maximally 3/8" (9.5 mm). The space available widthwise for the gear 1 is
30 determined by the distance B between the cranks 16, which distance varies per

type of bicycle. By using a relatively narrow roller chain 20, more second sprockets 22 can be positioned within the limited width B, so that the number of possible transmission ratios increases.

For moving the roller chain 20 between the second sprockets 22, the gear 1 is provided with a derailleur 32. This derailleur 32 comprises a first, and, parallel thereto, a second plate 34, 35. These plates 34, 35 are movable along two guiding pins 37, 38, which are mounted parallel to the crankshaft 6 between the first and second side plates 3, 4 of the housing 2. The plates 34, 35 extend between the sprocket cassette 21 on the secondary shaft 8 and the crankshaft 6, while overlapping, at least partially, the driving first sprocket 18 on both sides. The mutual distance between the plates 34, 35 is such that, when moving the plates 34, 35 along the guiding pins 37, 38, the driving first sprocket 18 is moved along therebetween and therefore moves along the crankshaft 6, while, with the plates 34, 35 at a standstill, the driving first sprocket 18 can preferably rotate freely between the plates 34, 35. The plates 34, 35 of the derailleur 32 are connected, at the sides remote from each other, to a first end of an operating cable 40, which operating cables are connected at a second end to an operating handle 41 on or near the handlebar 59 of the bicycle 30. With the aid of this operating handle 41 and the cables 40, the plates 34, 35 and the first sprocket 18 located therebetween can be moved along the guiding pins 37, 38, respectively, and the crankshaft 6.

The derailleur is further provided with a chain tensioner 42, for accompanying the lateral movement of the roller chain 20 along the different second sprockets 22 and for compensating the occurring differences in necessary chain length. To that end, the chain tensioner 42 comprises two parallel arms 43, 44 which can swivel about a swivel pin 45, extending perpendicularly to the plates 34, 35. Between the ends of the swivelling arms 43, 44, a first and a second guiding wheel 46, 47 are rotatably suspended between the plates 34, 35. At some distance from the swivel pin 45, a draw spring 48 engages the two swivelling arms 43, 44, under the influence of which

the chain 20, which is guided between the two guiding wheels 46, 47, is tensioned. In Figs. 3a and 3b are shown two extreme positions of the chain tensioner 42, which occur when the roller chain 20 engages a second sprocket having a larger diameter 55 or a smaller diameter 54, respectively. In the first position (Fig. 3a), for instance, the full length of the roller chain 20 is needed to embrace the driving first sprocket 18 and the second sprocket 55. The chain tensioner 42 is in an extreme position, in which the draw springs 48 are stretched out and the roller chain 20 lies approximately stretched out between the guiding wheels 46, 47. In the second position (Fig. 3b), a shorter chain length suffices to embrace the driving first sprocket 18 and the second sprocket 54. Under the influence of the draw springs 48, the first guiding wheel 46 exerts an upward force and the second guiding wheel 47 a downward force on the roller chain 20, so that the excess length of the chain 20 is tensioned in an S-bend between the two guiding wheels 46, 47. Thus, the chain 20 remains under sufficient tension during its movement along and its cooperation with the different sprockets 22, 54, 55. The concept of chain tensioner 42 should, for that matter, be herein understood to mean a guiding element suitable for guiding and tensioning all types of chains that can be used between the driving first and one of the second sprockets 18, 22.

Due to the limited space between the plates 34, 35, the swivelling arms 43, 44 and the draw springs 48 are mounted on the outside of the plates 34, 35 in the example shown in Figs. 1 and 2. Further, for the purpose of the path travelled by the guiding wheels 46, 47 during the guidance of the roller chain 20 between the two extreme sprocket positions, the plates 34, 35 are provided with two arcuate slots 49, 50.

Further, the derailleur 32 is preferably provided with limiting means 51, with which the stroke of the driving first sprocket 18 along the crankshaft 6 is limited. In this manner, the driving first sprocket 18 is prevented from being moved beyond the outermost two sprockets 54, 55. Such a limitation can, for instance, be formed by a projection or a different spacer

between, on the one hand, the first side plate 3 and/or the second side plate 4 and, on the other hand, the plates 34, 35.

The operation of the gear 1 as described hereinabove is as follows. The starting position is, for instance, the position shown in Fig. 2, where the driving first sprocket 18 lies opposite the largest second sprocket 55, which
5 corresponds to the smallest transmission ratio, that is, the lowest speed of the gear. In this position, the operating handle 41 will also be in an extreme position, so that the left operating cable 40_L, shown in Fig. 2, cannot be pulled further to the left. Optionally, to this end, a limiting means 51 as already
10 described above can be provided. If the operating handle 41 is moved in the opposite direction, corresponding to the pulling of the right-hand operating cable 40_R, the two plates 34, 35 will move to the right along the guiding pins 37, 38, thereby also moving the driving first sprocket 18 along the crankshaft 6. Also the roller chain 20 is thereby pulled sideward so that, at a certain
15 moment, a tooth of the largest sprocket but one 56 will engage a link of the roller chain 20, after which the other teeth and links follow. The chain length necessary for embracing the sprocket 56 is somewhat shorter than the length necessary for the sprocket 55. The difference in length is compensated in the manner described hereinabove by the chain tensioner 42. In this manner, the
20 driving first sprocket 18 will be moved along the successive second sprockets 22 to the smallest second sprocket 54. Preferably, a limiting means 51 is built in at that side for preventing further movement of the driving first sprocket 18. By operating the handle 41 in the opposite direction, the driving first sprocket 18 will move back in the direction of the largest sprocket 55 in the
25 same manner as described hereinabove, except that in this case the necessary length of the roller chain will increase. The chain tensioner 42 will therefore, during the movement of the sprocket 18 along the crankshaft 6, be moved from a position shown in Fig. 3b to a position shown in Fig. 3a.

Fig. 4 shows an example of how the gear 1 can be installed in a
30 bicycle 30. The mounting bracket 5 is fixed to several bars of the bicycle frame,

for instance by welding. This mounting bracket 5 is of a strong and rigid design which is such that it can absorb and transmit propelling forces to the rest of the bicycle frame. For instance, the bracket can be manufactured from steel, but, with a view to the reduction of weight, is preferably manufactured from aluminum, or plastic, or the like. After fitting the bracket 5, the first and second side plate 3, 4, having therebetween the crankshaft 6, the secondary shaft 8, the sprocket cassette 21 and the derailleur 32, can be slid as a whole into the mounting bracket 5. The bracket 5 and the housing plates 3, 4 are provided, at mutually corresponding positions, with holes 60 with which the above parts can be mounted onto each other by means of bolts and nuts. Then, a cover 7 can be provided at the location of the interruption in the mounting bracket 5 through which the gear has been slid in, so that, in mounted condition, a closed housing 2 is formed by the first side plate 3, the second side plate 4, the mounting bracket 5 and the cover 7. Naturally, the housing 2 with the bracket 5 can also be mounted in a bicycle in one go. Due to the housing 2, the gear 1 can be installed in a very simple manner. Additionally, the gear 1 is protected by the housing 2 from dirt, moisture and unforeseen external forces and the cyclist is protected, during use, from undesired contact with moving parts of the gear 1. Furthermore, the housing 2, especially the bracket 5, gives the construction the necessary rigidity and strength as has been indicated hereinabove. This autonomous rigidity and the limited dimensions of the gear 1 give the gear a lot of freedom of installation. Although the position of the crankshaft 6 is substantially fixed, the position of the secondary shaft 8 can be varied. Two examples hereof are represented in Figs. 5a and b. In Fig. 5a, viewed in the riding direction, the secondary shaft 8 is located behind the crankshaft 6, at approximately the same height as the crankshaft 6, while in Fig. 5b the secondary shaft 8 is located obliquely above the crankshaft 6, in line with a saddle tube. These different installation positions affect, inter alia, the orientation and length of the rear fork. Assuming that the rear fork is preferably mounted approximately parallel to the upper half of the second

roller chain for obtaining the most favorable pressure load instead of bending load, a shortest possible rear fork can be realised in an installed position as shown in Fig. 5b, which may be desirable, for instance, for racing bikes. Due to the different installation possibilities, the gear 1 is therefore suitable for use in
5 a large number of frames varying in shape and size.

Further, with a gear 1 according to the invention, the rear wheel of the bicycle can be symmetrically spoked, since the rear hub 29 only needs to be equipped with a single fourth sprocket 28, and moreover this sprocket 28 can be of limited dimension when the driving third sprocket 25 is suitably selected.
10 This is in contrast to the known gears, wherein the second sprockets are located on the rear hub and take up such an amount of space there that the left- and right-hand side of the rear wheel have to be provided with different spokes, which, moreover, have to be disposed in different positions. A symmetrically spoked wheel is stronger, more stable and has a longer life span
15 since the forces acting on the wheel are evenly distributed over the spokes. Moreover, a symmetrical spoking is easier to provide.

It will be clear that the invention is not limited to the exemplary embodiments given in the description and the drawing. Many variations are possible within the scope of the invention as outlined by the claims.

20 For instance, the gear can be combined with an overdrive outside of the housing. To that end, an extra driving sprocket can be placed next to the driving third sprocket on the secondary shaft. Its installation can be executed with a front derailleur known from practice, while an extra chain tensioner is necessary for keeping the second roller chain between the secondary shaft and
25 the rear hub tensioned. Thus, either the number of speed possibilities of the gear increases, or the same number of speeds can be obtained with fewer second sprockets.

Also, a gear according to the invention can be combined with a gear known from practice, whereby the rear hub is provided with a narrow sprocket
30 cassette with only two or three sprockets at most and an associated second

derailleur. Thus, the number of transmission ratios to be set increases still further. The same result can be achieved by installation of a gear hub, for instance a 3-gear hub. Furthermore, one of the operating cables of the derailleur can be replaced with springs between a plate of the derailleur and a
5 side plate of the housing. Thus, a simpler operating mechanism is obtained and, moreover, when an operating cable breaks or comes loose, the derailleur returns to a preferred position, for instance opposite the smallest second
... ~~sprocket. Means known per se can be used for positive adjustment of the~~
different transmission ratios.

10 These and many variations are considered to fall within the scope of the invention as outlined by the claims.

Claims

1. A gear for setting a transmission ratio between a crankshaft and a rear hub of a bicycle, comprising a driving first sprocket (18) mounted on the crankshaft (6), which can be coupled via a first roller chain (20) and a derailleur (32) to a sprocket as desired from a series of second sprockets (22) different in diameter which are mounted on a secondary shaft (8); which secondary shaft (8) is located parallel to and at a relatively short distance from the crankshaft (6) and to which secondary shaft (8), further, a driving third sprocket (25) is mounted, which, via a second roller chain (27), is connected to a fourth sprocket (28) on the rear hub (29).
- 10 2. A gear according to claim 1, wherein the driving first sprocket (18) is movable in axial direction along the crankshaft (6) with the aid of the derailleur (32).
3. A gear according to claim 1 or 2, wherein the driving first sprocket (18), with the aid of the derailleur (32), is positionable directly opposite each of the series of second sprockets (22) mounted on the secondary shaft (8), the arrangement being such that the first roller chain (20) is in each case in line with said first and second sprockets (18, 22) and is loaded substantially in the longitudinal direction.
- 15 4. A gear according to any one of the preceding claims, wherein the derailleur (32) comprises two parallel plates (34, 35) connected to each other at some distance from each other, which, by means of at least one operating cable (40), are movable in a direction parallel to the crankshaft (6), and which plates (34, 35) are positioned relative to the driving first sprocket (18), such that when the plates (34, 35) are at a standstill, this first sprocket (18) can rotate therebetween without contacting the plates and, during movement of the plates (34, 35), can move along between them, along the crankshaft (6).
- 20 25

5. A gear according to any one of the preceding claims, wherein the series of second sprockets (22) on the secondary shaft (8) is arranged from large to small, the largest sprocket (55) being preferably located on the side of the driving third sprocket (25).
- 5 6. A gear according to any one of the preceding claims, wherein the diameter of the largest second sprocket (55) on the secondary shaft (8) is smaller than or equal to the diameter of the driving first sprocket (18).
7. A gear according to any one of the preceding claims, wherein the second sprockets (22) on the secondary shaft (8) comprise between 11 and 24
10 teeth.
8. A gear according to any one of the preceding claims, wherein the first roller chain (20) is a derailleur chain and has a link length which is smaller than 12.7 mm (1/2"), preferably smaller than 9.5 mm (3/8") and, in particular, approximately 8 mm.
- 15 9. A gear according to any one of the preceding claims, wherein the first roller chain (20) has an internal link width which is smaller than 3.2 mm (1/8") and preferably 2.6 mm and wherein the external link width is equal to approximately 7 mm.
10. A gear according to any one of the preceding claims, wherein the
20 derailleur (32) between the plates (34, 35) comprises a chain tensioner (42) for guiding and tensioning the first roller chain (20).
11. A gear according to claim 10, wherein the chain tensioner (42) comprises an arm (44) swivelling parallel to the plates (34, 35), which arm is provided at both ends with guiding wheels (46, 47), which, by means of a bias
25 spring (48) connected to the arm (44), can be pushed against the roller chain (20) on opposite sides, so that the roller chain (20) is tensioned.
12. A gear according to any one of the preceding claims, wherein the gear (1) is included in a housing (2).

13. A gear according to claim 12, wherein the housing (2) comprises a mounting bracket (5), which can be mounted on or is included in a frame of a bicycle.

14. A gear according to claim 13, wherein the housing (2) is mountable
5 in the mounting bracket (5), such that the position of the crankshaft (6) bearing-mounted in the housing (2) corresponds to the standard position of such a crankshaft (6) in the bicycle.

15. A gear according to claim 13 or 14, wherein the gear (1) pre-mounted
10 in the housing (2) can be mounted on the mounting bracket (5) with the aid of a few fastening means or detached therefrom, respectively.

16. A gear according to any one of claims 12 – 15, wherein the housing (2) comprises a cover (7), which for the purpose of inspection and maintenance of the gear (1) is readily detachable and mountable, respectively.

17. A gear for setting a transmission ratio between a crankshaft and a
15 rear hub of a bicycle, preferably according to any one of the preceding claims, comprising

- a compact housing (2), with a crankshaft (6) bearing-mounted therein;
- a driving first sprocket (19), slideably provided on the crankshaft (6);
- 20 - a secondary shaft (8), bearing-mounted within the housing (2) parallel to and at a relative short distance from the crankshaft (6);
- a series of second sprockets (22) mounted on the secondary shaft (8) within the housing (2), mutually differing in diameter;
- a derailleur (32) positioned within the housing (2) between the
25 crankshaft (6) and the secondary shaft (8);
- a derailleur chain in the shape of a first roller chain (20) having a link length of preferably at most approximately 3/8" (9.5 mm), which extends between the driving first sprocket (18) and one of the second sprockets (22) to be selected with the aid of the derailleur; and

a driving third sprocket (25), mounted on a part of the secondary shaft (8) extending to outside the housing (2) and coupled to a fourth sprocket (28) on the rear hub (29) by means of a second roller chain (27);

wherein said parts are dimensioned in such a compact manner that the gear in the housing, protected from moisture, dirt and damage, can be installed fitting within the usual space between the cranks of a bicycle.

18. A gear according to claim 17, wherein the derailleur (32) comprises two parallel plates (34, 35) connected with each other at a relatively short distance, and a chain tensioner (42) mounted therebetween, suitable for guiding and tensioning at least the derailleur chain (20), the arrangement being dimensioned such that the whole is positionable substantially within the space available between the driving first sprocket (18) and the series of second sprockets (22), and is movable parallel to the crankshaft (6) with the aid of an operating mechanism, in particular an operating cable (40), engaging the plates (34, 35).

19. A bicycle provided with a gear according to any one of claims 1–18, wherein the secondary shaft (8) is located between the crankshaft (6) and the rear hub (29), at approximately the same height as the crankshaft (6).

20. A bicycle provided with a gear according to any one of claims 1–18, wherein the secondary shaft (8) is located near an end of a frame tube (58) extending from a saddle (60) in the direction of the crankshaft (6).

21. A method for installing a gear according to any one of claims 12–18, wherein the gear (1) in its housing (2) is slid into a mounting bracket (5) provided on the bicycle, and is subsequently fastened to this mounting bracket (5).

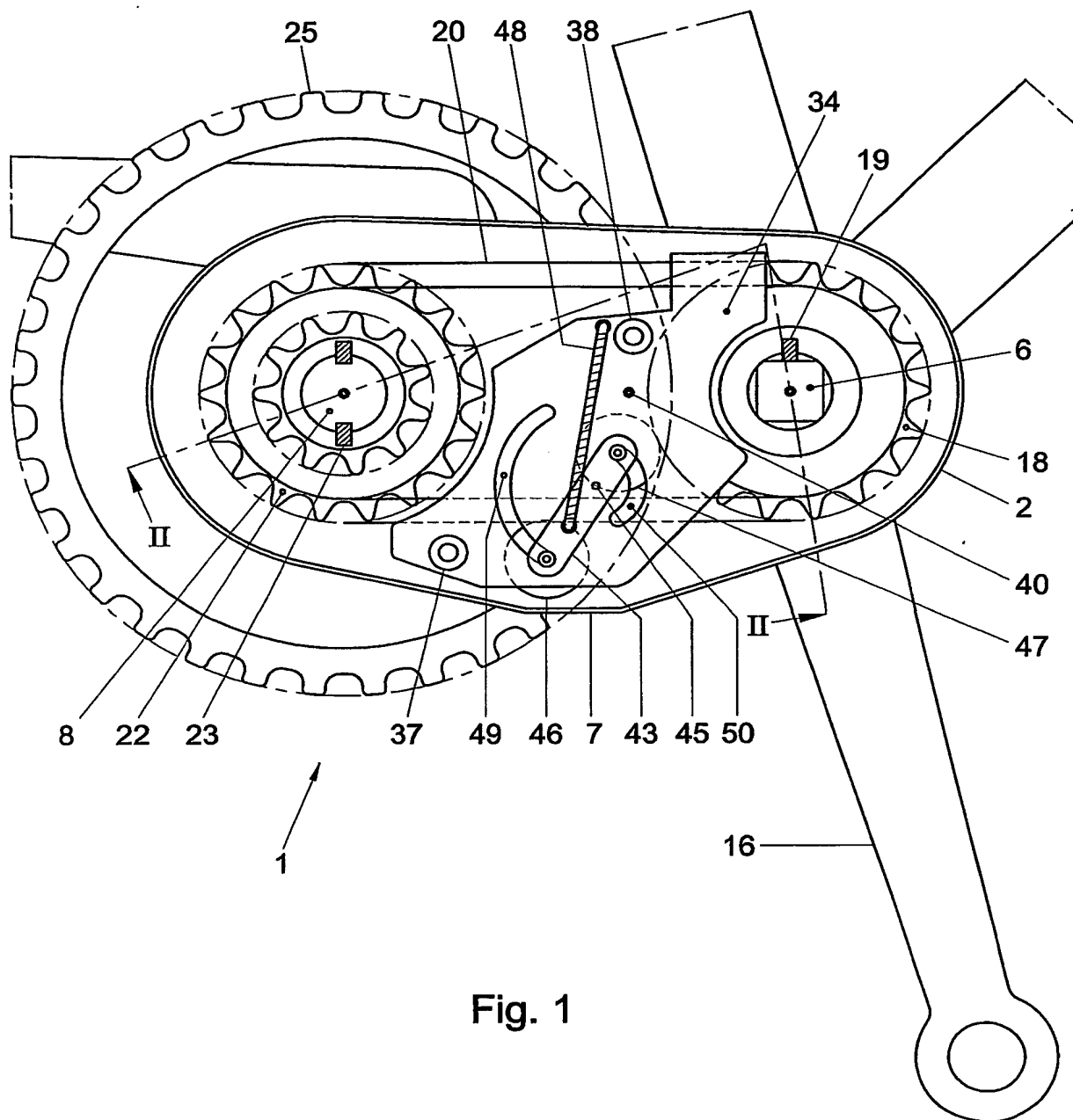


Fig. 1

2/4

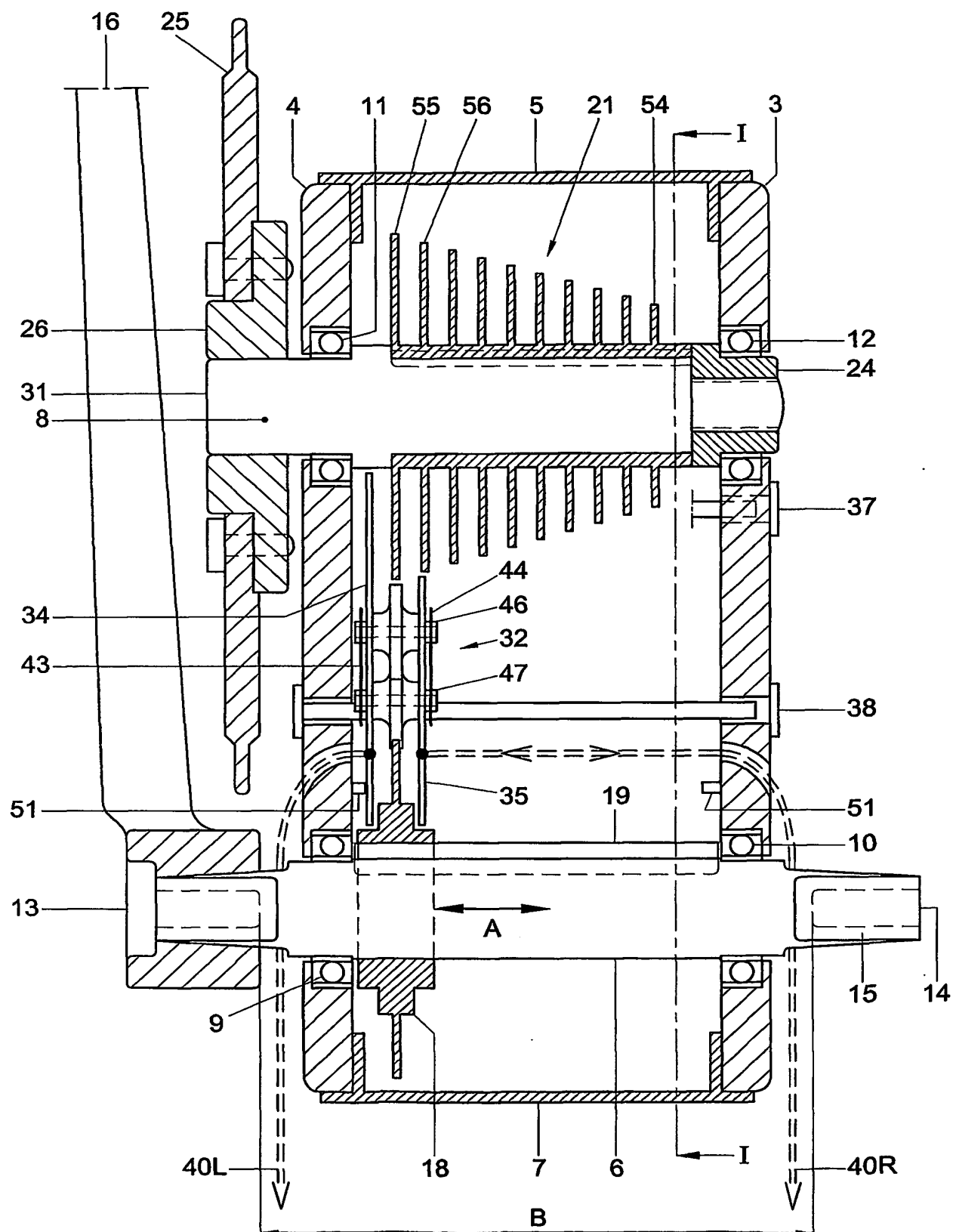


Fig. 2

SUBSTITUTE SHEET (RULE 26)

3/4

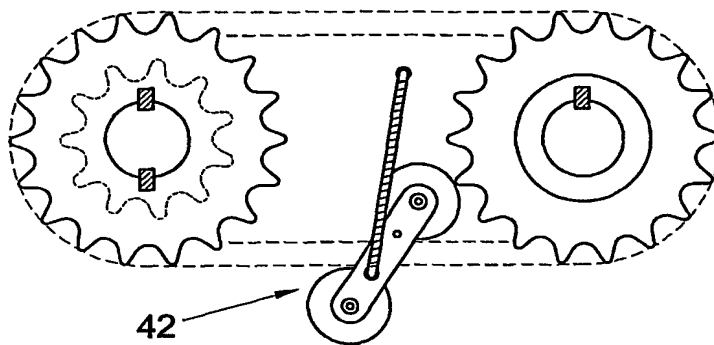


Fig. 3A

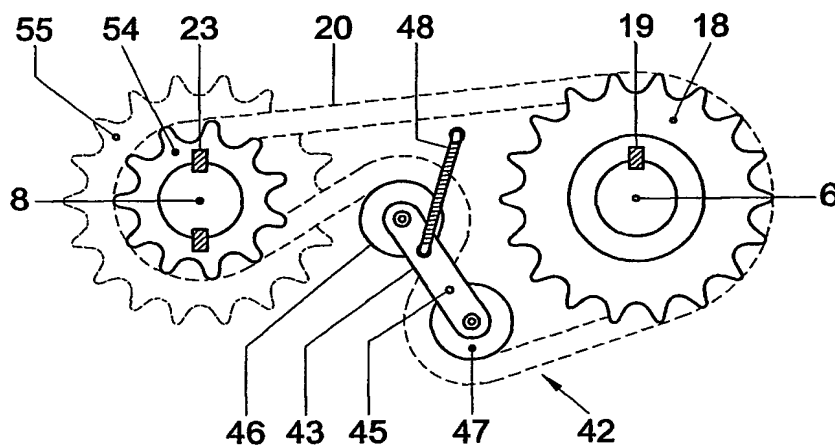


Fig. 3B

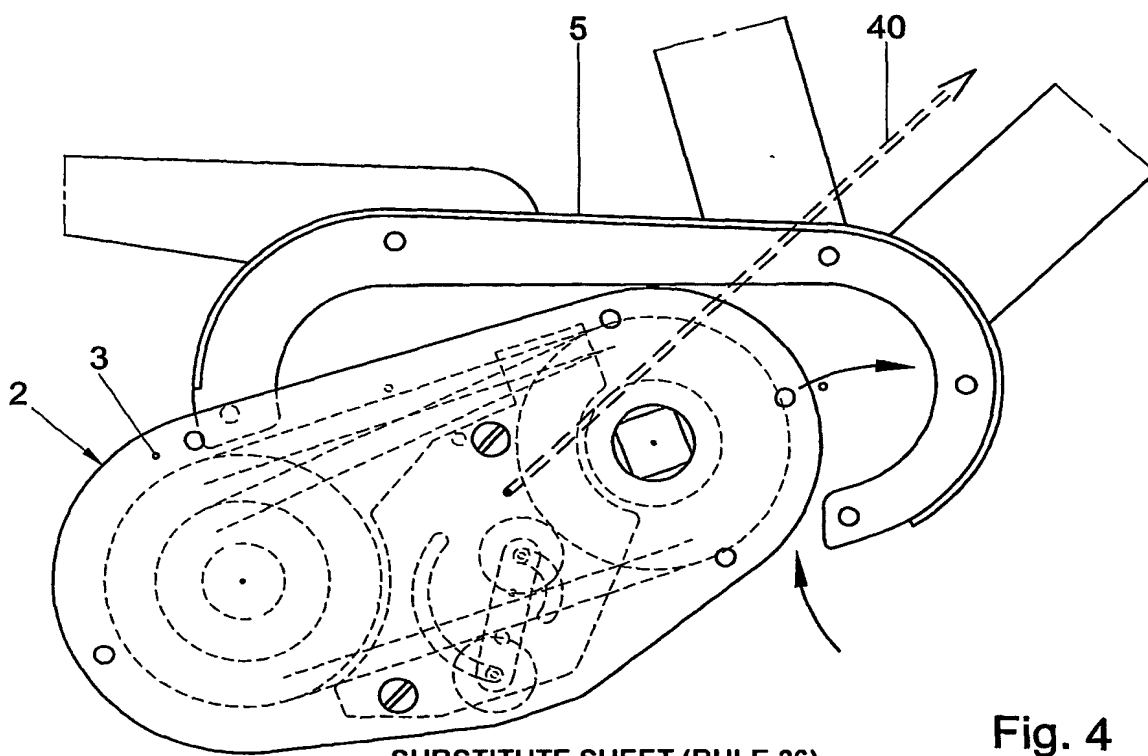


Fig. 4

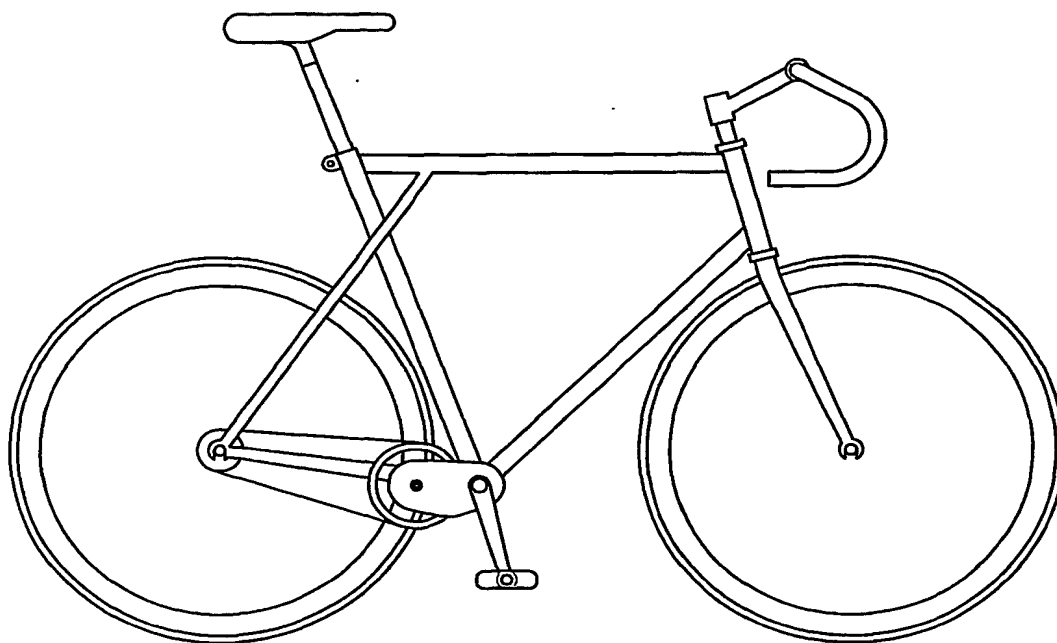


Fig. 5A

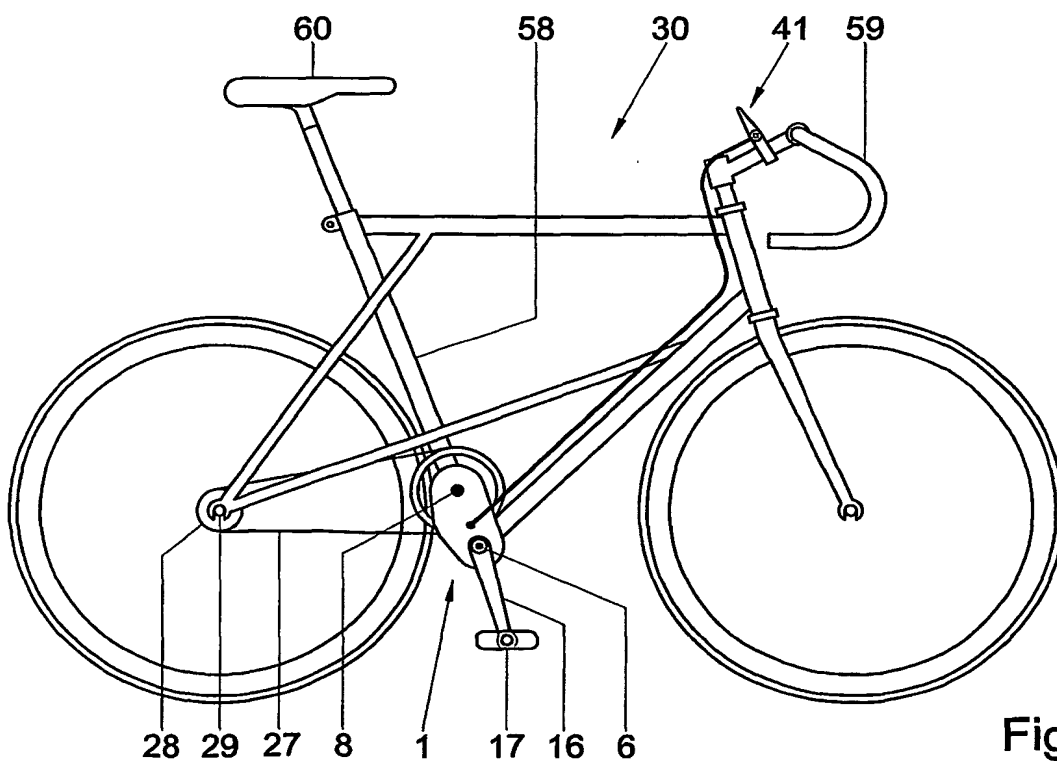


Fig. 5A

INTERNATIONAL SEARCH REPORT

In ☐ national Application No

PCT/NL 01/00551

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 B62M9/04 B62M11/06

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 B62M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EP0-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 39 08 385 C (MÜLLER) 13 June 1990 (1990-06-13) the whole document	1-21
A	EP 0 761 529 A (IDIT) 12 March 1997 (1997-03-12) the whole document	1-3, 17
A	DE 41 29 198 A (MÜLLER) 4 March 1993 (1993-03-04) the whole document	1, 17



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

* Special categories of cited documents :

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

T later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

X document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

Y document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

& document member of the same patent family

Date of the actual completion of the international search

8 November 2001

Date of mailing of the international search report

16/11/2001

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Denicolai, G

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/NL 01/00551

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
DE 3908385	C	13-06-1990	DE 3908385 C1	13-06-1990
EP 761529	A	12-03-1997	IT MI951874 A1	06-03-1997
			DE 69601990 D1	12-05-1999
			DE 69601990 T2	16-09-1999
			EP 0761529 A1	12-03-1997
			ES 2132816 T3	16-08-1999
			JP 9164988 A	24-06-1997
			US 5730670 A	24-03-1998
DE 4129198	A	04-03-1993	DE 4129198 A1	04-03-1993